Japan - Plutonium *Investigation* n°2

Two Accidents Have Left Their Traces : Monju and Tokai

Sodium Leak and Fire at Monju

On 8 December 1995, the secondary cooling circuit of the Monju reactor leaked 700 kg of molten sodium, the largest (known) sodium leak ever during the operation of a reactor. The leak occurred after the rupture of a measuring device (a thermometer well). The rupture was caused by a very basic design fault combined with the absence of an efficient system to detect such errors. A subsequent fire occurred as sodium burns when in contact with air and reactos violently when added to water. The fire and the chemical reaction attacked the metal lining on the floor up to a depth of 3 cm. The sodium corrosion products were spread throughout the plant because of a delay in shutting down the ventilation system. Furthermore, the failure to quickly shut down the 260 MWe demonstration fast-breeder reactor demonstrated a surprising weakness in PNC's sodium handling technology.

Two years after the accident, it is unclear yet if the reactor will resume operation.

One of the characteristics of fast-breeder reactors is the reactor coolant which consists of molten sodium rather than the water coolant used in light water reactors. The secondary cooling circuit, which removes heat from the primary cooling circuit transferring it to the electricity generating water circuit, is also molten sodium. The presence of hundreds or in some cases thousands of tons of sodium in fast-breeder reactors generates chemical risks which do not exist with water reactors. Even though extensive research programs on safety problems related to sodium have been pursued over the last thirty years, the chemical reactivity of sodium is not completely understood. On 31 March 1994, during the dismantling of the small research fast-breeder reactor, Rapsodie, at Cadarache, France, an unexpected reaction involving about 100 kg of sodium led to a violent explosion. A technician, an outspoken sodium expert, died in this accident and four others were injured.

The Monju sodium leak was not a severe nuclear accident, since it did not involve the release of radioactivity into the environment nor the injury to any of the reactor's personnel. The repercussions of the Monju accident are however very severe in terms of financial costs, the credibility of the operator, PNC, and for that matter, the credibility of the entire plutonium program. The operator was apparently unprepared for such a leak and the shut down procedure was not triggered as early as it should have been. PNC officials have also admitted trying to conceal information from the public, notably through the editing of a biased video tape which was distributed to the media. An investigation on the responsibilities of the accident has had a dramatic episode: the Deputy Administration Manager at PNC's head office, who had been designated chief investigator, killed himself after stating to the press that the head office had a responsibility in the cover-up.

The safety bureau of the government Science and Technology Agency (STA) suspended at the beginning of August 1997 Monju's operating license for a year. A local court also found PNC and two managers of the plant guilty of giving incomplete information in a report on the accident for STA. The governor of the Fukui prefecture, where Monju is located, appears to be opposed to the restart of Monju, at least in the near future. However, without his approval Monju cannot be restarted.

Fire and Explosion at Tokai-mura

During the morning of 11 March 1997, a fire occurred in the bitumen waste facility of the demonstration reprocessing plant at Tokai-mura. The fire was not completely extinguished and about ten hours later, after chemicals had accumulated, an explosion occurred which ruptured the confinement of the facility. At least 37 workers were internally contaminated with radioactive cesium and 10 billion becquerels or more of radionuclides released into the environment. Radioactive cesium released during the accident was detected in Tsukuba, in the Tokyo suburbs, about 160 km from the Tokai-mura site.

Bitumen is used to solidify intermediate-level activity liquid radioactive waste. The fire apparently occurred after errors made in monitoring a chemical reaction.

The accident was rated as level three on the International Nuclear Event Scale (INES) defined by the International Atomic Energy Agency. This is the first, and only, level three accident in Japan, and one of the few level three accidents in the world since the establishment of the international scale at the beginning of the 1990's. The plant will be shut down until at least 2001, and further operation is not envisaged without the installation of new waste handling facilities.

As in the case of the Monju accident, PNC, operator of the plant, demonstrated mismanagement of both internal and external information. Before the explosion, a report sent to the STA authority falsely stated that the fire had been extinguished, although no such information had been issued by the site. Photos taken by PNC workers were destroyed. PNC also waited five hours before informing the authorities that there was a radiation leak. The first figures concerning the release of radioactivity during the accident were underestimated by a factor of ten to twenty.

Apart from the general disapproval of this, one reaction was that for the first time STA filed a formal complaint against PNC and police raided two PNC offices. The credibility of PNC was all the more criticised since a similar cover-up had happened after the sodium accident at 1994 Monju - also operated by PNC - and that PNC should have changed its attitude concerning public information since. Monju and the reprocessing plant are two of the most important components of the plutonium industry in Japan.

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